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THE EFFECTS OF ACCOMMMODATION FOR COGNITIVE STYLE IN THE PERFORMANCE OF RURAL, MEXICAN AMERICAN HIGH SCHOOL PUPILS

by

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THE EFFECTS OF ACCOMMODATION FOR COGNITIVE STYLE IN THE PERFORMANCE OF RURAL, MEXICAN AMERICAN HIGH SCHOOL PUPILS

Accommodation for cognitive style has implications for instructional programs in geographic areas where school populations are largely Mexican American. While Spanish language dominance may logically account for a portion of lower academic marks and achievement test scores attained by Mexican American pupils, there is evidence to indicate that a bias exists in the classroom environment which also accounts for a part of the learning difference. Cognitive style, with inherent preferences by pupils and teachers for the reception and delivery of instruction, and for varying degrees of preference for social interaction, has been shown to be a prominent factor in classroom bias.

On a continuum of field independent-analytical and field dependent-global style as described by Witkin, Goodenough, Moore, and Cox (1977), Ramirez and Price-Williams (1974) and Canavan (1969) found that Mexican American pupils tended to be field dependent-global perceivers and processors of information while non-minority pupils* tended toward the field independent-analytical style. Another study by Ramirez, Castaneda, and Herold (1972) found that Mexican American children in rural mostly Spanish-speaking communities, clearly tended to be field dependent-global, in cognitive style. The two high schools involved in the study here reported conform to the description just cited: both are 100 miles from the nearest metropolitan center and within 75 miles of the Mexican-United States border, both are economically dependent on ranching and farming, and both communities' populations contain in excess of eighty percent (80%) Mexican Americans. Approximately seventy percent (70%) of the pupils entering kindergarten are classified as limited English speakers.

Numerous studies have shown that the natural classroom is biased unfavorably for the field dependent-global Mexican American pupil who does not impose as much structure on the field as his field independent counterpart does and has difficulty disassembling the whole of a given situation into separate parts. Stein (1969), Perney (1971), and Cooperman (1974) report that field independent-analytical stylists, who perceive the parts as distinct from the whole, perform better in acquiring academic marks and higher achievement test scores. A study by Cohen (1969) found that the classroom environment was biased in favor of students with the field independent-analytical style and that many of the items for measuring attainment were slanted to the advantage of the field independent learner. Witkin (1) observed that "children with learning disabilities, especially in reading, tend to be field dependent (1972)."

The effects of the intersection of the field dependent-global tendency of Mexican American pupils and the field dependence of disabled readers tend to be confirmed by the Texas Assessment Project measure of mastery of ten essential objectives in reading in a statewide sample of 172,000 eleventh grade pupils administered in April, 1978. The mean score of the approximately 30,000 Mexican American pupils in the sample was lower than that of non-minority pupils on all ten objectives. On the four objectives labeled higher order cognitive skills: 1) evaluating information and making judgements, 2) making inferences and drawing conclusions, 3) distinguishing between fact and fiction, and, 4) making generalizations based on given details and assumptions, the mean score for Mexican American pupils was below the mastery level on all of the four objectives (T.E.A., 1978). The rural Mexican American pupil would seem to be working with a dual handicap in the educational system: 1) lack of facility in the English language, and 2) a classroom environment which does not accommodate the pupil's natural style for perceiving and processing information to solve problems.

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* Footnote: Non-minority in this paper refers to pupils also labeled "Anglo Americans."

The problem investigated in this study was, "Can the factors which compose classroom environment be manipulated in a predictable direction to accommodate cognitive style?" If a classroom environment can be found which accommodates learning style in a predictable direction, further research may be able to discover a practical model for a classroom that is inherently fair to all pupils regardless of how information is perceived and processed by them.

The three aspects of the classroom environment which this study examined were 1) teacher-pupils style match and mismatch, 2) modes of instructional delivery preferred by teachers of each style, and 3) the degree of social interaction and competition preferred by pupils of each style. Differences among students due to Spanish language dominance were not considered and were isolated from the effects of cognitive style by the inclusion of only Mexican American pupils in the study.

Efforts have been made in other studies to unbias the classroom environment in the first aspect considered by this study, notably teacher-pupil matching and mismatching. Witkin (2) observed that "...persons matched in cognitive style tend to get along better...for three possible reasons: first, because of a shared foci of interests; second, because of common personal characteristics; and, third, because of similarity in communication modes." DiStefano (1970) found that teachers and pupils who were matched in cognitive style tended to rate each other favorably, while pupils and teachers who were mismatched by style tended to give each other negative ratings. A study by Doebler and Eicke (1979) found that teachers cognizant of the effects of cognitive style on learning, and with knowledge of their own cognitive preferences as well as those of their pupils, could produce positive attitudinal changes without cognitive style matching. Awareness of personal style, and of variations in style in others, has been shown to produce a more wholesome classroom atmosphere compared with classes where this awareness was lacking, but has not been reported as powerful enough by itself to alter the cognitive production of pupils. The present study incorporated training for teachers' awareness of their own cognitive styles and of the effects of style variation in pupils. Teachers were informed of their own personal styles, but were not told the styles of the subjects involved in the study.

The second aspect into which this study provided intervention was the benefits to students induced by instruction delivered in a mode preferred by teachers. Wu (1967) found that field dependent-global teachers preferred the discussion-discovery method of delivery while field independent-analytical teachers preferred the expository-deductive method. The research of Grieve and Davis (1971), in a study of extremely field dependent and extremely field independent ninth grade pupils, tended to support this assumption in part by their findings that extremely field dependent boys were likely to benefit most from the discovery method of instruction. Witkin (3) concluded with respect to this point: "This outcome makes sense when we consider that in the discovery method, compared with the expository method, learning takes place through interaction with the teacher, a context congenial to the social orientation of the more field dependent student (1972)."

The study reported here incorporated a daily checksheet appropriate to the assigned mode of instruction for each teacher so that the basic elements of the delivery of instruction could be controlled. The checksheets employed are shown in Table 1. On the Field Dependent-Discovery Checklist, the first three check points are designed to structure a delay in providing generalizations and to preclude a lecture type delivery; teachers are instructed to explain objectives, to emphasize facts without providing a correct model, and to encourage pupils to discover generalizations for themselves while trial and error attempts provide a specific time for pupil-teacher interaction. The Field Independent-Expository Checklist directs a lecture type delivery with an immediate exposure of generalizations by modeling as shown in the third and fourth check points on the list.

The third aspect of this study, concerning the preferred social interactions of pupils by style, is incorporated in those sections of the checklists which control classroom organization and management. The basic concern was with the regulation of the effect of the preferred sociability in field dependent pupils and of the task completion focus of field independent pupils. "Field dependent persons have what in effect amounts to a sensitive radar system, selectively attuned to social components of the environment (Witkin, 1977)." Field dependent persons observe faces to detect what other are thinking and feeling (Konstadt and Forman, 1956); unintentionally remember faces better than field independent persons do (Crutchfield, 1958); attend to verbal messages with a social context better than field independent persons do (Fitzgibbons, et al., 1965): are influenced by the opinions of others in defining their attitudes and feelings (Linton, 1952); and are better at picking up social cues (Ruble and Nakamura, 1972) Field independent persons have been found not sensitive to social undercurrents (Pemberton, 1952), and they are more likely to be interested in the abstract and theoretical (Biggs, Fitzgerald, and Atkinson, 1971). These results seem to confirm the previous description of field dependent pupils and teachers as preferring a more social environment which conforms to the discovery-inductive mode of delivery. Also, the preference of field independent pupils and teachers for the less socially sensitive and more task oriented expository-deductive delivery may be logically concluded from the literature. However, the research of Kagan and Madsen (1971) injects the question of the degree of response to social stimuli present in Mexican American pupils who were found to be more cooperative than their Anglo non-minority peers in achieving rewards and less competitive than non-minority children in obtaining goals.

The present study makes the assumption that field independent-analytical Mexican American pupils have social needs in conjunction with task orientation and may not be as insensitive to the social cues and social undercurrents as pupils in the general population. Because of cultural influence, Mexican American field independent pupils may require more provision for sociability in the classroom environment than is normally available in an expository-lecture type setting. To incorporate these assumptions into the process of this study, the Field Independent-Expository Checklist makes provision for social interactions in the conduct of the classroom; these provisions are shown as check points one, two, five and six on the appropriate checklist in Table 1. Only one social element is included in the Field Dependent-Discovery Checklist in addition to the social interaction believed to be inherent in the inductive method; this is shown in check point four on the appropriate checklist in Table 1, in which the teacher is directed to work individually with pupils.

One final effect to insure an equal reception-delivery system within both modes is presented in the Field Dependent Checklist. To balance the probable competitiveness of field independent Mexican American pupils, check point five provides a format for field dependent pupil competition.

Summary of Research Problem

In light of the findings reported above it seems evident that many rural school districts in South Texas are confronted with a unique distribution of learning styles, i.e., the overwhelming majority of pupils served are field dependent. The evidence presented to date suggests that this uneven distribution of learning styles, due to the Mexican American populations, is an educational liability. If a methodology can be found to accommodate field dependent learning style in such situations, the condition can be significantly alleviated if not converted into an asset. This study was designed to determine whether factors in the classroom environment can be manipulated to accommodate cognitive style with enough force to affect performance in cognitive tasks. Three factors of classroom environment were investigated: 1) the matching and mismatching of teacher-pupil cognitive style, 2) the natural and adaptive style of delivery of instruction by trained teachers, and, 3) pupil encounters in both naturally preferred and non-preferred classroom social settings.

The hypotheses explored were:

1. *Pupils diagnosed as being either field dependent or field independent in cognitive style matched by the cognitive style of the teacher and by mode of instruction used by the teacher will make significantly greater gains on the pre-posttest How To Study unit than pupils mismatched by both the cognitive style of the teacher and mode used by the teacher to deliver instruction.*

2. *Pupils mismatched by the cognitive style of the teacher and matched by the mode of instruction preferred by the teacher will show no difference in gains on the pre-posttest How To Study unit, in comparison with gains made by pupils matched by the cognitive style of the teacher and mismatched by the mode of instruction (adaptive) preferred by the teacher.*

METHODS AND PROCEDURES

Subjects and Test. The Group Embedded Figures Test (GEFT) was administered to 237 Mexican American high school pupils and 15 teachers in two rural high schools in South Texas, and norms for college students were used to identify field independent-analytic and field dependent-global subjects. Of the 237 pupils tested, 143 (seventy-seven in school A and sixty-six in school B) participated in the study as regular students in the classrooms of 12 teachers (six from school A and six from school B) selected for the study. Teachers were stratified by cognitive style and chosen randomly for mode of instructional delivery: three field dependent (Fd) teachers were assigned to utilize the discovery-inductive mode, and three Fd teachers were assigned to use the expository-deductive mode; three field independent (Fi) teachers were assigned to the discovery-inductive mode, and three Fi teachers were assigned the expository-deductive mode.

Instructional Materials. A How To Study unit was prepared and presented to the students in three hours of instruction. The unit consisted of three daily activity packets titled: Recall of Fact and Detail, Comprehending Main Idea, and Making Judgements and Drawing Conclusions. The packets were self-contained, utilizing short reading selections and response sheets, and the materials were arranged from

simple to complex. All teachers were provided a Strategies Checklist (See Table 1) for the mode of instruction assigned, a manual in the form of a verbatim script keyed to the Strategies Checklist, answer keys to all activities; in addition, Fd mode teachers were provided a scoreboard for recording daily scores. Teachers were given two, one-hour training sessions in the effects of cognitive style on learning with emphasis on the characteristics of Mexican American pupils. "Introduction to Cognitive Style," and "Field Sensitivity (Dependence) and Field Independence in Children" by Ramirez, Herold, and Castaneda were used as basic texts and copies were provided to teachers for reference. A one-hour session was designed to train teachers to utilize the check sheet in following the mode of instruction, discovery-inductive or expository-deductive, to which they were assigned. Teachers used the check sheet in the classroom with their regular course of instruction for one week of practice before the study.

Testing Instruments. Two tests of 24 items each were made from: 1) The Alameda County Listening Comprehension Skills, 2) Jamestown Comprehension Series, and 3) Pauk's A Skill at a Time. Test items covered recalling fact and detail, comprehending main ideas, and making judgements and drawing conclusions. Items were rated for reading difficulty by the Fry Readability Scale, ranked by the levels of Bloom's Taxonomy, matched on content covered and skill tested, and divided into equivalent levels for pre and post testing.

Instructional Procedure. Teachers were instructed to follow the script of the lesson for the "How To Study" unit as closely as possible and to check the Strategies Checklist during or immediately after the conclusion of the experimental class each day.

Students were given three hours of instruction on consecutive days related to the package of student materials on How To Study, preceded by a pre-test and followed by a posttest.

Experimental Design. Teachers were chosen before the final training session on the basis of cognitive style until 6 field dependent and 6 field independent instructors had been selected as previously described. By an odd-even number drawing, the 6 teachers from each cognitive style were assigned to teach in a preferred or adaptive mode. The pupils in attendance in the regular second period class of each teacher were assigned as experimental subjects; the pupils had been originally placed in class by computer scheduling. Three classes used pupils from third period regular classes because of teacher conference period conflicts. Teachers were told their own personal cognitive style but were not informed of the individual styles of the pupils served.

The analytical design was a 2x2x2 factorial procedure with student cognitive style (Fi or Fd), mode of instruction (discovery-inductive or expository-deductive), and teacher cognitive style (Fi or Fd) as independent variables. The dependent variable was pupil performance on a 24 item test covering the unit of instruction. Post test results were analyzed by student style, teacher style, and mode of instruction with an analysis of variance; mean gain scores for each group were analyzed for significance with a t-test for non-independent samples and mean gains between groups with a t-test for independent samples. An analysis of covariance was applied when pre-test scores were found to be significantly different between groups.

TABLE 1

FIELD INDEPENDENT-EXPOSITORY STRATEGIES CHECKLIST

The teacher

*1. Expresses confidence in the pupil's ability to succeed.

*2. Gives example(s) of how the lesson is useful to the pupil personally.

**3. Makes principles (parts) of the lesson obvious:

A. Pupils are told how parts fit together.

B. Pupils are told how things work to produce expected outcomes.

**4. Provides the correct model of desired performance.

*5. Provides for cooperative effort and group assignments:

A. Classroom arrangement

B. Group projects

C. Peer teaching

*6. Gives personal recognition to pupil(s).

FIELD DEPENDENT-DISCOVERY STRATEGIES CHECKLIST

The teacher

**1. Explains the objectives of the lesson, making sure that all pupils understand what is to be accomplished.

**2. Explains the key points of the lesson and emphasizes the fact(s) to be learned, but DOES NOT GIVE A CORRECT MODEL.

**3. Points out that pupils are to discover how the facts fit together, and gives each pupil at least two trial-and-error attempts before providing direct assistance.

*4. Provides a classroom arrangement in which each pupil works individually, with emphasis on each doing his/her own work.

***5. Sets up a competition to give recognition to the highest mark of the day:

A. Has a scoreboard for daily marks

B. Comments each day on the highest marks

* Social component
** Cognitive style component
*** Competitive component

RESULTS

The distribution of GEFT scores resulted in the classification of 105 Mexican American pupils as field dependent-global and 38 as field independent-analytical in cognitive style. The slightly higher percentage of field dependent pupils than found by Ramirez or Canavan may be the result of using college normative data. The mean score for Mexican American boys (N = 79) of 6.55 was slightly higher than that of Mexican American girls (N = 64) of 6.29, as was expected. Comparison of pre and posttest scores supported previous studies which showed that field independent pupils perform better on school tasks: the mean pre-test score for field dependent subjects was 12.40 and for field independent subjects 15.68. This difference was significant at the .001 level ($t = 7.76$, $df = 142$); the mean posttest scores were 15.01 and 18.71 respectively and this difference was also significant at the .001 level ($t = 3.73$, $df = 142$).

Although Fi pupil performance was shown to be generally superior, this study indicated that teachers trained in awareness of cognitive style effects and in mode of instructional delivery can bias the classroom environment in a predictable direction. *It is of interest to note that bias was not shown to be the result of the expected cognitive style matching and mismatching of pupils and teachers.* The data were treated with a three-way analysis of covariance with posttest scores as the dependent variable, and pupil style, method of instructional delivery, and teacher style as the independent variables and covaried by pre-test scores for significance of main and interaction effects. These data are presented in Table 2.

TABLE 2: THREE-WAY ANALYSIS OF COVARIANCE

Source of Variation	SS	DF	F	Significance of F
Main Effects	23.478	3	2.476	.064
Pupil	52.587	1	5.326	.023**
Teacher	4.378	1	0.443	.507
Method	12.005	1	1.214	.273
2-Way Interactions	49.633	3	1.672	.176
Pupil-Method	13.855	1	1.401	.239
Pupil-Teacher	2.233	1	0.226	.636
Method-Teacher	33.895	1	3.426	.066 *
3-Way Interaction	11.078	1	1.120	.292
Pupil - Teacher - Method	11.078	1	1.120	.292
Explained		8		
Total		142		

As shown in Table 2, the main effect of Fi pupils' pre-posttest performance was shown to be significant (**). While no significance was found in the 2-way interactions of the independent variables, a trend for better performance of pupils when teachers were matched by preferred mode of delivery (*) was indicated.

A three-way analysis of covariance using a regression approach confirmed the main effect of the Fi style and strengthened the tendency of a relationship between pupil performance and the matching of teachers with preferred style of delivery as shown in Table 3.

TABLE 3: THREE - WAY ANALYSIS OF COVARIANCE USING A REGRESSION APPROACH

Source of Variation	SS	DF	F	Significance of F
Main Effects	87.521	3	2.949	.035
Pupil	45.507	1	4.600	.034 **
Method	19.742	1	1.996	.160
Teacher	9.181	1	0.928	.337
2-Way Interaction	60.693	3	2.045	.111
Pupil - Method	16.445	1	1.662	.199
Pupil - Teacher	0.961	1	0.970	.756
Method - Teacher	44.973	1	4.546	.035 **
3-Way Interaction	11.078	1	1.120	.292
Pupil - Method - Teacher	11.078	1	1.120	.292
Explained		8		
Total		142		

As shown in Table 3, both the main effect of Fi pupil pre-posttest performance (**) and the interaction of teacher and method (**) were shown to be significant.

The interaction effects of the preferred and adapted mode of delivery of instruction by teachers who are both matched and mismatched by the cognitive style of the pupils is shown in Table 4.

TABLE 4

PUPIL PERFROMANCE COMPARED BY MATCH AND MISMATCH OF COGNITIVE STYLE AND MODE OF INSTRUCTION DELIVERED BY TEACHERS IN THE CLASSROOM

TEACHERS MATCHED BY PREFERRED MODE OF DELIVERY AND PUPIL STYLE

		Mean	SD	N	Difference	t	Significance	
1A	FD Teacher/Discovery Mode/FD Pupil							
	Pre-test	12.52	3.75	27	3.22	4.52	P	.001
	Post-test	15.74	4.35					
2A	FI Teacher/Expository Mode/FI Pupil							
	Pre-test	13.89	3.31	9	*5.11	4.60	P	.01
	Post-test	19.00	2.44					

*Difference in groups significant at the .05 level (t = 3.20, df = 35).

TEACHERS MISMATCHED BY PREFERRED MODE OF DELIVERY AND PUPIL STYLE

		Mean	SD	N	Difference	t	Significance	
1B	FD Teacher/Expository Mode/FI Pupil							
	Pre-test	17.14	2.87	14	*2.50	3.64	P	.01
	Post-test	19.64	2.05					
2B	FI Teacher/Discovery Mode/FD Pupil							
	Pre-test	13.36	3.26	22	1.50	1.66	ns	
	Post-test	14.86	3.76					

*Difference in groups significant at the .01 level (F = 7.33, df = 1/33).

TEACHERS MATCHED BY PREFERRED MODE OF DELIVERY AND MISMATCHED BY PUPIL STYLE

		Mean	SD	N	Difference	t	Significance	
1C	FD Teachers/Discovery Mode/FI Pupil							
	Pre-test	15.00	2.91	8	3.50	18.77	P	.001
	Post-test	18.50	3.12					
2C	FI Teacher/Expository Mode/FD Pupil							
	Pre-test	11.81	4.17	27	2.75	4.65	P	.001
	Post-test	14.56	5.02					

TEACHERS MISMATCHED BY PREFERRED MODE OF DELIVERY AND MATCHED BY PUPIL STYLE

		Mean	SD	N	Difference	t	Significance	
1D	FD Teachers/Expository Mode/FD Pupils							
	Pre-test	12.10	3.10	29	*2.76	4.78	P	.001
	Post-test	14.86	3.50					
2D	FI Teacher/Discovery Mode/FI Pupil							
	Pre-test	15.86	2.47	7	.85	.625	ns	
	Post-test	16.71	2.76					

*Difference in groups significant at the .05 level (F = 6.39, df = 1/33).

Teachers Matched by Preferred Mode of Delivery and Pupil Style. As shown in Table 4 (1A - 2A), pupils matched by the cognitive style of the teacher and by the mode preferred by the teacher for the delivery of instruction showed significant gains. The performance of Fi pupils was significantly better than that of Fd pupils, when compared by means of a t-test.

Teachers Mismatched by Preferred Mode of Delivery and Pupil Style. As shown in Table 4 (1B - 2B), some pupils were mismatched by the cognitive style of the teacher, and instruction was delivered by the teacher in an adaptive mode rather than a preferred mode. A variation of results between groups taught in an adaptive mode was produced. Field independent pupils were found to perform significantly better than Fd pupils in this mode-style environment. Analysis of covariance showed that field independent pupils (1B) made gains that were not found to be significantly different from the perfectly matched Fi pupils in 2A, while Fd pupil results shown in 2b were found to be significantly different at the .05 level when compared with perfectly matched Fd pupils (1A) by the Duncan's Multiple Range Test.

Teachers Matched by Preferred Mode of Delivery and Mismatched by Pupil Style. As shown in Table 4 (1C - 2C), some pupils were mismatched by the cognitive style of the teacher and instructed in a delivery mode preferred by the teacher. No significant difference was found in the performance of either Fi or Fd pupils in this mode-style environment when groups were compared by an analysis of covariance, nor was either group found to be significantly different from the perfectly matched groups in 1A - 2A respectively when compared by the Duncan's Multiple Range Test.

Teachers Mismatched by Preferred Mode of Delivery and Matched by Pupil Style. As shown in Table 4 (1D - 2D), some pupils were matched by the cognitive style of the teacher and instruction was delivered by the teacher in an adaptive mode rather than a preferred mode. Findings showed a tendency to produce a variation of results between groups. Field dependent pupils (1D) taught in an adaptive mode by Fd teachers were found to perform significantly better than Fi pupils in this mode-style environment when results were compared by an analysis of covariance; also, the gains made by Fd pupils were not found to be significantly different from the gains made by perfectly matched Fd pupils in 1A when compared by the Duncan's Multiple Range Test.

The degree of field dependence-independence as indicated by GEFT scores attained by all pupils involved in the study and pupil performance on pre-posttest scores was correlated with the four groupings of the teacher's natural cognitive style and the preferred and adaptive modes of instructional delivery. Table 5 shows these data.

TABLE 5: CORRELATION OF PUPIL PERFORMANCE WITH DEGREES OF FIELD DEPENDENCE - FIELD INDEPENDENCE IN PUPILS

Correlation Between Achievement and Pupil GEFT Scores	* Partial Correlations Between Posttest and Pupil GEFT Scores	Delivery Mode / Teacher Style
(1)	(2)	(3)
r = .59	r = .45	Expository/Field Independent
r = .57	r = .42	Discovery/Field Dependent
r = .62	r = .32	Expository/Field Dependent
r = .17	r = .10	Discovery/Field Independent

* Pre-test scores are partialed out.

In Column I of Table 5 the positive correlations indicate pupil field dependence-field independence related to pre-posttest achievement in each of the four groupings. In Column 2 the degree of field dependence-independence is correlated with posttest scores without taking the entry level into consideration and is reported in the four groupings. The results show that there is a tendency for the delivery mode - teacher match to increase the relationship, and that field dependency - independency is least related to achievement in the mismatch of field independent teacher utilizing a discover-inductive mode of delivery.

Hypothesis #1

Pupils diagnosed as being either field dependent or field independent in cognitive style matched by the cognitive style of the teacher and by mode of instruction used by the teacher will make significantly greater gains on the pre-posttest How To Study unit that pupils mismatched by both the cognitive style of the teacher and mode used by the teacher to deliver instruction.

Although pupils prefectly matched by the cognitive style of the teacher and the preferred mode of delivery of instruction by the teacher (1A - 2A) did make significant gains, an analysis of variance showed that the results obtained when Fi pupils in 1B, who were mismatched by the cognitive style of the teacher, and where instruction was delivered by a Fd teacher in a non-preferred, adaptive, expository-deductive mode (1B), were not significantly different from the gains of perfectly matched pupils in 1A and 2A. A t-test of independent samples showed that the three groups with significant gains (1A - 2A - 1B) performed significantly better than Fd pupils mismatched by the cognitive style of the teacher and the preferred mode of delivery by the teacher (2B) at the .05 level ($t = 2.51$, $df = 71$).

These results tend to confirm the trends indicated in Table 2 and Table 3, that positive gains in pupil performance are related to an interaction of Method - Teacher, and in Table 5 which evidenced that the least effective type of interaction was likely to be a Field Independent teacher delivering instruction in an adaptive discovery- inductive mode. Hypothesis #1 is not supported by the data presented in this study.

Hypothesis #2

Pupils mismatched by the cognitive style of the teacher and matched by the mode of instruction preferred by the teacher will show no difference in gains on the pre-posttest How To Study unit, in comparison with gains made by pupils matched by the cognitive style of the teacher and mismatched by the mode of instruction (adaptive) preferred by the teacher.

As shown in 1C and 2C of Table 4, pupils of both cognitive styles made significant gains when taught in a style preferred by the teacher although pupils and teachers were mismatched by cognitive style. In 1D and 2D of Table 4 a variation of results was found between groups in which the pupil-teacher cognitive style was matched and pupils were taught in a non-preferred adaptive style by the teacher. Pupils taught by Fd teachers in an adaptive expository-deductive mode made gains that were not significantly different from those made by pupils in 1C and 2C who were taught in a natural, preferred mode of instruction. Pupils taught by Fi teachers in an adaptive discovery-inductive mode made no significant gains.

Analysis of covariance indicated a trend for the three groups making significant gains (1C - 2C - 1D) to perform better than the Fi pupils taught in an adaptive mode by Fi teachers (2D) at the .06 level ($F = 3.47$, $df = 1/69$).

These results tend to add further support to the evidence given in Table 5 which showed that the least effective Method-Teacher interaction was likely to be a Field Independent teacher delivering instruction in a non-preferred discovery-inductive mode. Hypothesis #2 is not supported by the data presented in this study.

Conclusions:

The conclusions of this study are presented with the knowledge of specific limitations in the design and implementation. First, the three hours of time-on-task by pupils was a short duration of involvement and should be considered when analyzing results. Second, the sample is small and the data was acquired from a limited segment of a large geographic area. Third, the statistical significance of results was affected by the scarcity of Fi pupils in the study, although the evidence to date tends to show that this is a phenomenon linked with rural, predominantly Mexican American populations with which educators must contend.

1. While the mean GEFT scores of Mexican American boys was slightly higher than the mean score attained by Mexican American girls, the difference was not found to be significant. These data conflict with earlier data by Ramirez and Canavan, and may be a result of the sampling group, or may be evidence of the changing models, roles, or child-rearing practices of modern, rural Mexican American families. A more precise definition will require further research.

2. Field Independent Mexican American pupils performed at a higher level of academic proficiency than did Field Dependent Mexican American pupils. These data conform to the general trend of previous studies, and the result is not unexpected. If the classroom is biased in favor of Fi pupils, the cumulative effects of that bias could not reasonably be expected to be significantly altered during a study of short duration.

3. This study showed that the most powerful factor in obtaining significant cognitive growth from rural Mexican American pupils of either cognitive style tended to be the mode of delivery of instruction employed by the teachers. With training, a field dependent teacher delivered instruction in the preferred - discovery with equal efficiency as instruction delivered in the adaptive - expository mode; there was no significant difference in the performance of pupils of either style who were taught by field dependent teachers. Field Independent teachers delivered instruction with a high degree of efficiency in the preferred - expository mode as shown by the significant cognitive production of pupils of both styles, but were not effective in delivering instruction in the adaptive - discovery mode as shown by the absence of significant gains by students of either cognitive style who were taught in that environment. (See Table 4). From these results, the conclusion can be drawn that rural Mexican American pupils have a number of viable mode - style environments which are equally effective with the exception of a field independent teacher delivering instruction in a discovery mode.

4. This study indicated that field dependent teachers adapt to training to deliver instruction in a non-preferred expository mode better than Fi teachers adapt to the non-preferred discovery style of delivery. (See 1B and 1D, and 2B and 2D of Table 4 for a comparison of the results of non-preferred delivery of instruction by teachers of both styles). The conclusion might be drawn that the expository - lecture delivery mode is more cognitively structured, definable, and that transition is accomplished by overt performance whereas the discovery - inductive mode of delivery is more affectively structured, less definable, and that a transition of attitudes in pupil-teacher interactions may require more time to perfect than the study provided. Further research is required to determine if more efficient training can improve adaptation to the discovery mode of delivery by field independent teachers.

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